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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,537	05/07/2001	Tonglong Zhang	1875.0370000	7984

7590 11/07/2003

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EXAMINER

LEWIS, MONICA

ART UNIT PAPER NUMBER

2822

DATE MAILED: 11/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/849,537

Applicant(s)

ZHANG ET AL.

Examiner

Monica Lewis

Art Unit

2822

-- Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 3,4,6-10,12,13 and 16-68 is/are pending in the application.
- 4a) Of the above claim(s) 18,20-32 and 35-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3,4,6-10,12,13,16,17 and 38-68 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 May 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 14.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. This office action is in response to the amendment filed July 21, 2003.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 3, 4, 6-10, 12, 13, 16, 17 and 38-68 have been considered but are moot in view of the new rejection.

#### ***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "substrate having a plurality of contact pads on a first surface electrically connected through said substrate to a plurality of solder ball pads on a second surface of said substrate" must be shown or the feature(s) canceled from the claim(s) (See Claims 6, 13 and 38). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2822

5. Claims 6, 7, 50, 60, 61, 64, 65 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 5,903,052) in view of Hembree (U.S. Patent No. 6,117,797).

In regards to claim 6, Chen et al. ("Chen") discloses the following:

- a) a substrate (12a and 12b) (For Example: See Figure 1);
- b) a plurality of solder ball pads (36) on a second surface of said substrate (For Example: See Figure 1);
- c) substrate has a window opening that is open at said first surface and said second surface of said substrate (For Example: See Figure 1);
- d) a heat spreader (16) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (For Example: See Figure 1);
- e) a ring shaped stiffener (24) being centrally open in a first surface and a second surface, wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Figure 1);
- f) an integrated circuit (IC) die (14) that is mounted to said first surface of said heat spreader and is accessible through said window opening, wherein said die has opposing first and second surfaces said first surface of said IC die, said second surface of said IC die being mounted to said first surface of said heat spreader (For Example: See Figure 1); and
- g) second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB) (For Example: See Figure 2).

In regards to claim 6, Chen fails to disclose the following:

- a) a substrate having a plurality of contact pads.

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include contact pads as

Art Unit: 2822

disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Additionally, since Chen and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Chen.

b) die including at least one contact pad.

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include contact pads as disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Additionally, since Chen and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Chen.

In regards to claim 7, Chen discloses the following:

a) a wire bond that couples the first surface of said IC die to a corresponding metal trace on said first surface of said substrate (For Example: See Figure 1 and Column 2 Lines 45-67).

In regards to claim 7, Chen fails to disclose the following:

a) die including at least one contact pad.

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include contact pads as disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Art Unit: 2822

Additionally, since Chen and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Chen.

In regards to claim 50, Chen discloses the following:

a) an encapsulating material that fills a cavity formed by said ring shaped stiffener, said window opening, and said first surface of said heat spreader to encapsulate said IC die (For Example: See Figure 1).

In regards to claim 60, Chen discloses the following:

a) a substrate (12a and 12b) (For Example: See Figure 1);

b) a plurality of solder ball pads (36) on a second surface of said substrate (For Example: See Figure 1);

c) substrate has a window opening that is open at said first surface and said second surface of said substrate (For Example: See Figure 1);

d) a heat spreader (16) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (For Example: See Figure 1);

e) an integrated circuit (IC) die (14) having opposing first and second surfaces, said second surface of said IC die being mounted to said first surface of said heat spreader that is accessible through said window opening (For Example: See Figure 1); and

f) second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB) (For Example: See Figure 2).

In regards to claim 60, Chen fails to disclose the following:

a) a substrate having a plurality of contact pads.

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include contact pads as disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Art Unit: 2822

Additionally, since Chen and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Chen.

b) die including at least one contact pad.

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include contact pads as disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Additionally, since Chen and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Chen.

In regards to claim 61, Chen discloses the following:

a) heat spreader comprises at least one metal (For Example: See Column 3 Lines 11-13).

In regards to claim 64, Chen discloses the following:

a) heat spreader is substantially planar (For Example: See Figure 1).

In regards to claim 65, Chen discloses the following:

a) a thermally conductive adhesive that attaches said first surface of said heat spreader to said second surface of said substrate (For Example: See Column 3 Lines 6-10).

In regards to claim 67, Chen discloses the following:

a) a plurality of solder balls attached to said plurality of solder ball pads (For Example: See Figure 1).

Art Unit: 2822

6. Claims 8, 9 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 5,903,052) in view of Hembree (U.S. Patent No. 6,117,797) and Kinseisha (Japanese Patent No. 1018935).

In regards to claims 8 and 66, Chen fails to disclose the following:

a) a wire bond that couples said contact pad to said first surface of said heat spreader.

However, Kinseisha discloses a semiconductor device where the wire bond contacts the heat sink and contact pad (For Example: See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include a semiconductor device where the wire bond couples a contact pad to a heat spreader as disclosed in Kinseisha because it aids in discharging heat (For Example: See Abstract).

Additionally, since Chen and Kinseisha are both from the same field of endeavor, the purpose disclosed by Kinseisha would have been recognized in the pertinent art of Chen.

In regards to claim 9, Chen discloses the following:

a) second surface of said heat spreader is coupled to a ground potential of the PCB (For Example: See Figure 2).

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jamieson et al. (U.S. Patent No. 6,545,351) in view of Chen et al. (U.S. Patent No. 5,903,052) and Shibamoto et al. (Japanese Patent No. 2000286294).

In regards to claim 10, Jamieson et al. ("Jamieson") fails to disclose the following:

a) substrate is a tape substrate.



Art Unit: 2822

However, Shibamoto et al. ("Shibamoto") discloses a semiconductor device where the substrate is a tape substrate (For Example: See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include a tape substrate as disclosed in Shibamoto because it aids in improving electrical characteristics (For Example: See Abstract).

Additionally, since Li and Shibamoto are both from the same field of endeavor, the purpose disclosed by Shibamoto would have been recognized in the pertinent art of Li.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jamieson et al. (U.S. Patent No. 6,545,351) in view of Hembree (U.S. Patent No. 6,117,797) and Chen et al. (U.S. Patent No. 5,903,052).

In regards to claim 13, Jamieson discloses the following:

- a) a substrate (16) (For Example: See Figure 3);
- b) a plurality of solder ball pads (18) on a second surface of said substrate (For Example: See Figure 3);
- c) an integrated circuit die (12) that is mounted to said first surface of said substrate (For Example: See Figure 3);
- d) a heat spreader (30) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (For Example: See Figure 3);
- e) second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB) (For Example: See Figure 3); and
- f) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 4).

In regards to claim 13, Jamieson fails to disclose the following:

- a) a substrate having a plurality of contact pads.

Art Unit: 2822

However, Hembree discloses a semiconductor device with contact pads (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include contact pads as disclosed in Hembree because it aids in providing an electrical interconnection (For Example: See Figure 3b).

Additionally, since Jamieson and Hembree are both from the same field of endeavor, the purpose disclosed by Hembree would have been recognized in the pertinent art of Jamieson.

b) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate.

However, Chen discloses a stiffener connected to the substrate (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a stiffener connected to the substrate as disclosed in Chen because it aids in providing a good efficiency of heat spreading (For Example: See Column 2 Lines 8-33).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

9. Claims 38-49, 51, 3, 3 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jamieson et al. (U.S. Patent No. 6,545,351) in view of Chen et al. (U.S. Patent No. 5,903,052).

In regards to claim 38, Jamieson discloses the following:

a) a substrate (16) (For Example: See Figure 3);

b) a plurality of solder ball pads (18) on a second surface of said substrate (For Example: See Figure 3);

Art Unit: 2822

c) an integrated circuit die (12) having opposing first and second surfaces, said second surface of said IC die being mounted to said first surface of said substrate (For Example: See Figure 3);

d) a heat spreader (30) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate (For Example: See Figure 3); and

e) second surface of said heat spreader is capable of being coupled to a printed circuit board (PCB) (For Example: See Figure 3).

In regards to claim 38, Jamieson discloses the following:

a) a ring shaped stiffener being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate.

However, Chen discloses a stiffener connected to the substrate (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a stiffener connected to the substrate as disclosed in Chen because it aids in providing a good efficiency of heat spreading (For Example: See Column 2 Lines 8-33).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 39, Jamieson discloses the following:

a) heat spreader comprises at least one metal (For Example: See Column 4 Lines 35-39).

In regards to claim 40, Jamieson discloses the following:

a) at least one metal includes copper (For Example: See Column 4 Lines 35-39).

Art Unit: 2822

In regards to claim 41, Jamieson discloses the following:

a) at least one metal includes aluminum (For Example: See Column 4 Lines 35-39).

In regards to claim 42, Jamieson discloses the following:

a) second heat spreader is substantially planar (For Example: See Figures 3 and 4).

In regards to claim 43, Jamieson discloses the following:

a) a thermally conductive adhesive that attaches said first surface of said heat spreader to said second surface of said substrate (For Example: See Figures 3 and 4).

In regards to claim 44, Jamieson fails to disclose the following:

a) a thermally conductive adhesive that attaches said first surface of said ring shaped stiffener to said first surface of said substrate.

However, Chen discloses a semiconductor device with a adhesive that attaches the stiffener (For Example: See Column 3 Lines 49-53). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include an adhesive as disclosed in Chen because it aids in securing the components (For Example: See Figures 3 and 4).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 45, Jamieson fails to disclose the following:

a) ring shaped stiffener comprises at least one metal.

However, Chen discloses a semiconductor device with a metal stiffener (For Example: See Column 3 Lines 49-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a

Art Unit: 2822

metal stiffener as disclosed in Chen because it providing a package having good efficiency of spreading heat (For Example: See Column 3 Lines 49-61).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 46, Jamieson fails to disclose the following:

a) at least one metal includes copper.

However, Chen discloses a semiconductor device with a copper stiffener (For Example: See Column 3 Lines 49-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a copper stiffener as disclosed in Chen because it providing a package having good efficiency of spreading heat (For Example: See Column 3 Lines 49-61).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 47, Jamieson fails to disclose the following:

a) at least one metal includes aluminum.

However, Chen discloses a semiconductor device with a aluminum stiffener (For Example: See Column 3 Lines 49-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a aluminum stiffener as disclosed in Chen because it providing a package having good efficiency of spreading heat (For Example: See Column 3 Lines 49-61).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

Art Unit: 2822

In regards to claim 48, Jamieson fails to disclose the following:

- a) a plurality of solder balls attached to said plurality of solder ball pads.

However, Chen discloses a semiconductor device with solder ball pads (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include solder ball pads as disclosed in Chen because it providing an electrical connection (For Example: See Figure 1).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 49, Jamieson fails to disclose the following:

- a) an outer surface of said ring shaped stiffener is flush with an outer edge of said substrate.

However, Chen discloses a stiffener (For Example: See Figure 3b). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a stiffener as disclosed in Chen because it aids in providing a good efficiency of heat spreading (For Example: See Column 2 Lines 8-33).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 51, Jamieson fails to disclose the following:

- a) an encapsulating material that fills a cavity by said ring shaped stiffener and said first surface of said heat spreader to encapsulate said IC die.

However, Chen discloses a semiconductor device with encapsulating material (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include

Art Unit: 2822

encapsulating material as disclosed in Chen because it aids in protecting the device (For Example: See Column 3 Lines 63-67 and Column 4 Lines 1-3).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 3, Jamieson fails to disclose the following:

a) outer profile of said heat spreader overlaps with an inner profile of said ring shaped stiffener.

However, Chen discloses a semiconductor device where the heat spreader overlaps with the stiffener (For Example: See Figure 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include an overlap between the heat spreader and stiffener as disclosed in Chen because it aids in providing a good efficiency of heat spreading (For Example: See Column 2 Lines 8-33).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

In regards to claim 4, Jamieson discloses the following:

a) second heat spreader surface is plated with solder that allows said second heat spreader surface to be surface mounted to soldering pads on the PCB (For Example: See Column 2 Lines 48-50).

In regards to claim 12, Jamieson fails to disclose the following:

a) a wire bond that couples said contact pad to a corresponding metal trace on said first substrate surface.

However, Chen discloses a semiconductor device where the wire couples a contact pad corresponding to a trace on the substrate (For Example: See Figure 1). It would have been

Art Unit: 2822

obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a semiconductor device where the wire couples a contact pad corresponding to a trace on the substrate as disclosed in Chen because it permits an electrical connection to be made among components in the device (For Example: See Figure 1).

Additionally, since Jamieson and Chen are both from the same field of endeavor, the purpose disclosed by Chen would have been recognized in the pertinent art of Jamieson.

10. Claims 16, 17 and 52-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jamieson et al. (U.S. Patent No. 6,545,351) in view of Hembree (U.S. Patent No. 6,117,797), Chen et al. (U.S. Patent No. 5,903,052) Davies et al. (U.S. Patent No. 5,901,041).

In regards to claim 16, Jamieson fails to disclose the following:

a) a second heat spreader attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener.

However, Davies discloses a semiconductor device where the heat spreader (18) is attached to the heat sink (42) and die (12) (For Example: See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a heat spreader that is attached to the heat sink and die as disclosed in Davies because it aids in providing a compressed package (For Example: See Column 2 Lines 1-63).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

In regards to claim 17, Jamieson fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.



Art Unit: 2822

However, Davies discloses a semiconductor device that utilizes vias (For Example: See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include vias as disclosed in Davies because it aids in establishing an electrical connection among the components in the device (For Example: See Figure 2).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

In regards to claim 52, Jamieson fails to disclose the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive material.

However, Davies discloses a semiconductor device where the heat sink is attached to the stiffener (For Example: See Column 1 Lines 55-60). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include a heat sink attached to the stiffener as disclosed in Davies because it aids in providing a compressed package (For Example: See Column 2 Lines 1-63).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

In regards to claim 53, Jamieson fails to disclose the following:

a) second heat spreader is attached to said nonactive surface of said IC die with a thermally conductive adhesive material.

However, Davies discloses a semiconductor device where the heat spreader is attached to the heat sink and die with an adhesive (For Example: See Figure 3). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the

Art Unit: 2822

semiconductor device of Jamieson to include a heat spreader that is attached to the heat sink and die with an adhesive as disclosed in Davies because it aids in providing a compressed package (For Example: See Column 2 Lines 1-63).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

In regards to claim 54, Jamieson discloses the following:

a) heat spreader comprises at least one metal (For Example: See Column 4 Lines 35-39).

In regards to claim 55, Jamieson discloses the following:

a) at least one metal includes copper (For Example: See Column 4 Lines 35-39).

In regards to claim 56, Jamieson discloses the following:

a) at least one metal includes aluminum (For Example: See Column 4 Lines 35-39).

In regards to claim 57, Jamieson discloses the following:

a) second heat spreader is substantially planar (For Example: See Figures 3 and 4).

In regards to claim 58, Jamieson fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Davies discloses a semiconductor device that utilizes vias (For Example: See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include vias as disclosed in Davies because it aids in establishing an electrical connection among the components in the device (For Example: See Figure 2).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

In regards to claim 59, Jamieson fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Davies discloses a semiconductor device that utilizes vias (For Example: See Figure 2). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Jamieson to include vias as disclosed in Davies because it aids in establishing an electrical connection among the components in the device (For Example: See Figure 2).

Additionally, since Jamieson and Davies are both from the same field of endeavor, the purpose disclosed by Davies would have been recognized in the pertinent art of Jamieson.

11. Claims 62 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 5,903,052) in view of Hembree (U.S. Patent No. 6,117,797) and Atwood et al. (U.S. Patent No. 6,212,070).

In regards to claim 62, Chen fails to disclose the following:

a) at least one metal includes copper.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of copper (For Example: See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include heat sink comprised of copper as disclosed in Atwood because it is adaptable to a wide range of substrates (For Example: See Column 1 Lines 40-67 and Column 3 Lines 1-64).

Art Unit: 2822

Additionally, since Chen and Atwood are both from the same field of endeavor, the purpose disclosed by Atwood would have been recognized in the pertinent art of Chen.

In regards to claims 63, Chen fails to disclose the following:

- a) at least one metal includes aluminum.

However, Atwood discloses a semiconductor device that has a heat spreader comprised of aluminum (For Example: See Column 5 Lines 23 and 24). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Li to include heat sink comprised of aluminum as disclosed in Atwood because it is adaptable to a wide range of substrates (For Example: See Column 1 Lines 40-67 and Column 3 Lines 1-64).

Additionally, since Chen and Atwood are both from the same field of endeavor, the purpose disclosed by Atwood would have been recognized in the pertinent art of Chen.

12. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (U.S. Patent No. 5,903,052) in view of Hembree (U.S. Patent No. 6,117,797) and Shibamoto et al. (Japanese Patent No. 2000286294).

In regards to claims 68, Chen fails to disclose the following:

- a) substrate is a tape substrate.

However, Shibamoto discloses a semiconductor device where the substrate is a tape substrate (For Example: See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Chen to include a tape substrate as disclosed in Shibamoto because it aids in improving electrical characteristics (For Example: See Abstract).

Additionally, since Chen and Shibamoto are both from the same field of endeavor, the purpose disclosed by Shibamoto would have been recognized in the pertinent art of Chen.

***Double Patenting***

13. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

14. Claims 3, 4, 6-10, 12, 13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13 of U.S. Application No. 09/997,272. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

Art Unit: 2822

15. Claims 3, 4, 6-10, 12, 13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 11-13 of U.S. Application No. 09/984,259. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

16. Claims 3-13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-33 and 57 of U.S. Application No. 09/742,366. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

17. Claims 3-13, 16, 17 and 38-68 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-17, 35 and 36 of U.S. Application No. 09/783,034. Although the conflicting claims are not identical, they are not patentably distinct from each other because they both claim a ball grid array package.

### ***Conclusion***

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

Art Unit: 2822


however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 703-305-3743.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML

October 21, 2003



**AMIR ZARABIAN**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**